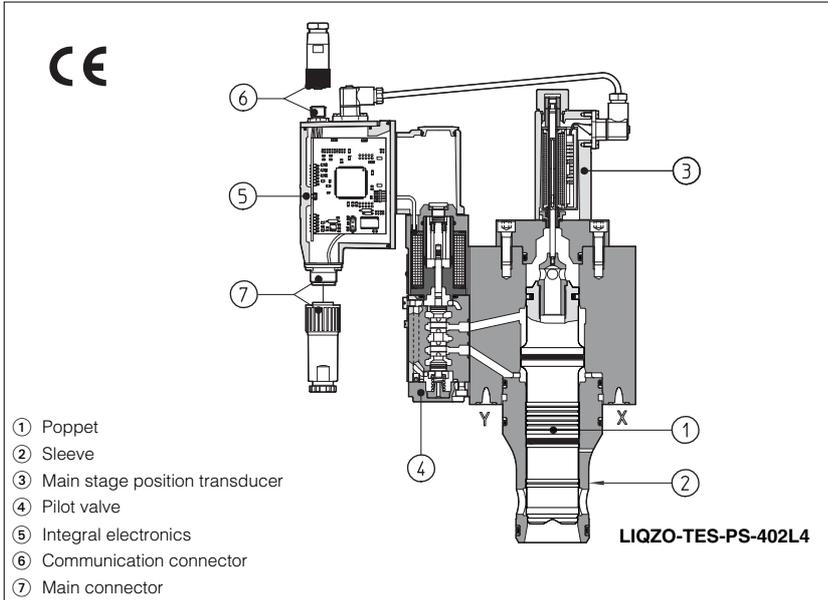


# Proportional throttle cartridges type LIQZO-T\*, 2-way

with position transducer, ISO 7368 sizes from 16 to 50



- ① Poppet
- ② Sleeve
- ③ Main stage position transducer
- ④ Pilot valve
- ⑤ Integral electronics
- ⑥ Communication connector
- ⑦ Main connector

LIQZO-TE are 2-way proportional cartridge valves, designed for mounting in manifold blocks and provide proportional flow control according to the electronic reference signal.

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align valve regulation to the reference signal supplied to the electronic driver.

They are available in different executions:

- -T, with position transducer ③;
- -TE, -TES as -T plus analogue (TE) or digital (TES) integral electronics ⑤.

The regulation is operated by means of a poppet ① with double piloting area, sliding into a sleeve ② and provided of integral LVDT position transducer ③.

The poppet is controlled in closed loop by means of a proportional directional valve ④ type DHZO, see table F160.

The integral electronics ⑤ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

The electronic main connector ⑦ is fully interchangeable for -TE and -TES executions.

Standard 7 pin main connector is used for power supply, analog input reference and monitor signals.

12 pin connector is used for option /Z.

Following communication interfaces ⑥ are available for the digital -TES execution:

- -PS, RS232 serial communication interface. The valve reference signal is provided with analogue commands.
- -BC, CANbus interface
- -BP, PROFIBUS-DP interface

The valves with -BC and -BP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.

Typical applications: plastic injection and blow moulding, foundry and steel plants.

Mounting surface: ISO 7368

Sizes from 16 to 50

Max flow up to 2000 l/min with differential pressure  $\Delta p = 5$  bar, see section 3.

Max pressure = 350 bar.

## 1 MODEL CODE

<b>LIQZO</b>	<b>- TES</b>	<b>- PS</b>	<b>- 25</b>	<b>2</b>	<b>L4</b>	<b>/ *</b>	<b>**</b>	<b>/*</b>
Flow control valve							Synthetic fluids: <b>WG</b> = water-glycol <b>PE</b> = phosphate ester	Series number
<b>T</b> = with position transducer <b>TE</b> = as T plus integral analog electronics <b>TES</b> = as T plus integral digital electronics						<b>Electronics options, for -TE execution see section 8:</b> <b>I</b> = current reference input and monitor (4÷20 mA) <b>F</b> = fault signal <b>Q</b> = enable signal <b>Z</b> = enable, fault and monitor signals (12 pins connector)		
Communication interfaces (only for TES) <b>PS</b> = Serial <b>BC</b> = CANopen <b>BP</b> = PROFIBUS DP						<b>Electronics options, for -TES execution see section 8:</b> <b>I</b> = current reference input and monitor (4÷20 mA) <b>Z</b> = double power supply, enable and fault		
Valve size, see section 3 <b>16 25 32 40 50</b>								
Valve configuration, see section 3 <b>2</b> = 2 way								
								Spool type (regulating characteristics): <b>L4</b> = linear

Versions with reduced flow are available on request \*2L2.

## 2 ELECTRONIC DRIVERS

Valve model	-T	-TE	-TES
Drivers model	E-ME-T	E-RI-TE	E-RI-TES
Data sheet	G140	G200	G210

**Note:** For power supply and communication connector see section 14

### 3 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

Hydraulic symbols	LIQZO-T		LIQZO-TE, LIQZO-TES		
Model	<b>LIQZO-T*</b>				
Size	16	25	32	40	50
Max regulated flow at $\Delta p = 5$ bar	250	500	800	1200	2000
at $\Delta p = 10$ bar	350	700	1100	1700	2800
Maximum flow	600	1200	1800	2500	4000
Max pressure [bar]	350				
Nominal flow of pilot valve at $\Delta p = 70$ bar	15				
Leakage of pilot valve at $P = 100$ bar	1				
Response time 0 ÷ 100% step signal	22	25	30	32	40
Piloting volume	1,58	2,16	7,0	9,4	8,5
Hysteresis [% of the max flow]	$\leq 0,5\%$				
Repeatability [% of the max flow]	$\leq 0,5\%$				
Thermal drift	zero point displacement < 1% at $\Delta T = 40^\circ C$				

#### Notes:

- Above performance data refer to valves coupled with Atos electronic drivers, see section 2.
- Recommended piloting pressure is 140 ÷ 160 bar.
- In case of long time shutdown of the hydraulic supply to the pilot valve, the driver has to be switched off to avoid its overheating.

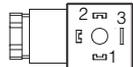
### 4 GENERAL NOTES

DHZO and DKZOR proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the installation notes supplied with relevant components.

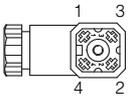
The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-892).

### 5 CONNECTIONS FOR -T EXECUTION

SOLENOID POWER SUPPLY CONNECTOR	
PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND



POSITION TRANSDUCER CONNECTOR			
SIZES 16 ÷ 40		SIZE 50	
PIN	Signal description	PIN	Signal description
1	OUTPUT SIGNAL	1	OUTPUT SIGNAL
2	SUPPLY -15 V <sub>DC</sub>	2	NOT CONNECTED
3	SUPPLY +15 V <sub>DC</sub>	3	SUPPLY +24 V <sub>DC</sub>
4	GND	4	GND



### 6 ANALOG INTEGRAL DRIVERS -TE - OPTIONS

Standard driver execution provides on the 7 pin main connector:

**Power supply** - 24V<sub>DC</sub> must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to the driver power supply. Apply at least a 10000  $\mu F/40$  V capacitance to single phase rectifiers or a 4700  $\mu F/40$  V capacitance to three phase rectifiers

**Reference input signal** - analogue differential input with  $\pm 10$  V<sub>DC</sub> nominal range (pin D,E), proportional to desired valve spool position

**Monitor output signal** - analog output signal proportional to the actual valve's spool position with  $\pm 10$  V<sub>DC</sub> nominal range

Following options are available to adapt standard execution to special application requirements:

#### 6.1 Option /F

It provides a Fault output signal in place of the Monitor output signal, to indicate fault conditions of the driver (cable interruption of spool transducers or reference signal - for /I option): Fault presence corresponds to 0 V<sub>DC</sub>, normal working corresponds to 24 V<sub>DC</sub>

#### 6.2 Option /I

It provides the 4÷20 mA current reference and monitor signals instead of the standard  $\pm 10$  V<sub>DC</sub>

It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

#### 6.3 Option /Q

It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24V<sub>DC</sub> on the enable input signal.

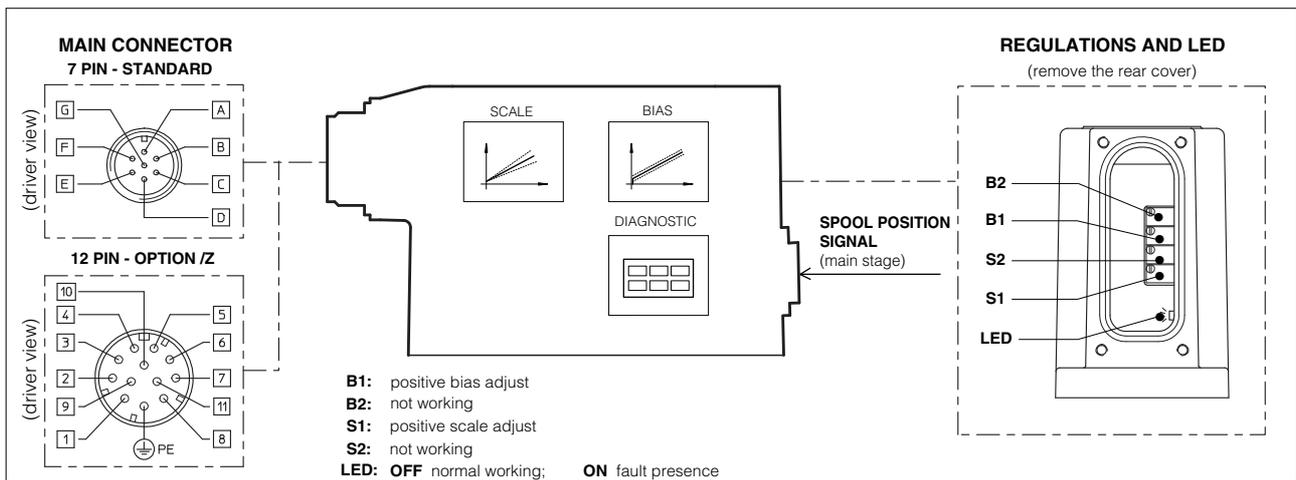
#### 6.4 Option /Z

This option includes /F and /Q features, plus the Monitor output signal.

When the driver is disabled (0 V<sub>DC</sub> on Enable signal) Fault output is forced to 0 V<sub>DC</sub>.

#### 6.5 Possible combined options: /FI and /IZ

## 7 ANALOG INTEGRAL DRIVERS -TE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



### 7.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 Vdc for solenoid power stage and driver logic	Input - power supply
B	2	V0	Power supply 0 Vdc for solenoid power stage and driver logic	Gnd - power supply
C (1)	7	AGND	Ground - signal zero for MONITOR signal (for standard, /Z option)	Gnd - analog signal
	3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver (for /Q and /Z options)	Input - on/off signal
D	4	INPUT+	Reference analog differential input: 0 ÷ +10 Vdc maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	5	INPUT -		
F (2)	6	MONITOR	Monitor analog output: ±10 Vdc maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
	11	FAULT	Fault (0V) or normal working (24V) (for /F and /Z options)	Output - on/off signal
-	8	R_ENABLE	Repeat Enable - output repetition of Enable input	Output - on/off signal
-	9	NC	do not connect	Output - on/off signal
-	10	NC	do not connect	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

#### Notes:

(1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is referred to pin B

(2) with /F option FAULT signal replaces MONITOR on pin F.

- A minimum time of 50ms to 100ms have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

## 8 DIGITAL INTEGRAL DRIVERS -TES - OPTIONS

Standard driver execution provides on the 7 pin main connector:

- Power supply** - 24Vdc must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to each driver power supply  
Apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers
- Reference input signal** - analogue differential input with ±10Vdc nominal range (pin D,E), proportional to desired valve spool position
- Monitor output signal** - analog output signal proportional to the actual valve's spool position with ±10Vdc nominal range

Following options are available to adapt standard execution to special application requirements:

### 8.1 Option /I

It provides 4÷20 mA current reference and monitor signals instead of the standard ±10 V.

It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

### 8.2 Option /Z

It provides on a 12 pin main connector the above standard features plus:

#### Logic power supply

Option /Z provides separate power supply for the solenoid (pin 1, 2) and for the digital electronic circuits (pin 9, 10).

Cutting solenoid power supply allows to interrupt the valve functioning but keeping energized the digital electronics thus avoiding fault conditions of the machine fieldbus controller (e.g. for emergency, as provided by the European Norms EN954-1 for components with safety class 2).

#### Enable Input Signal

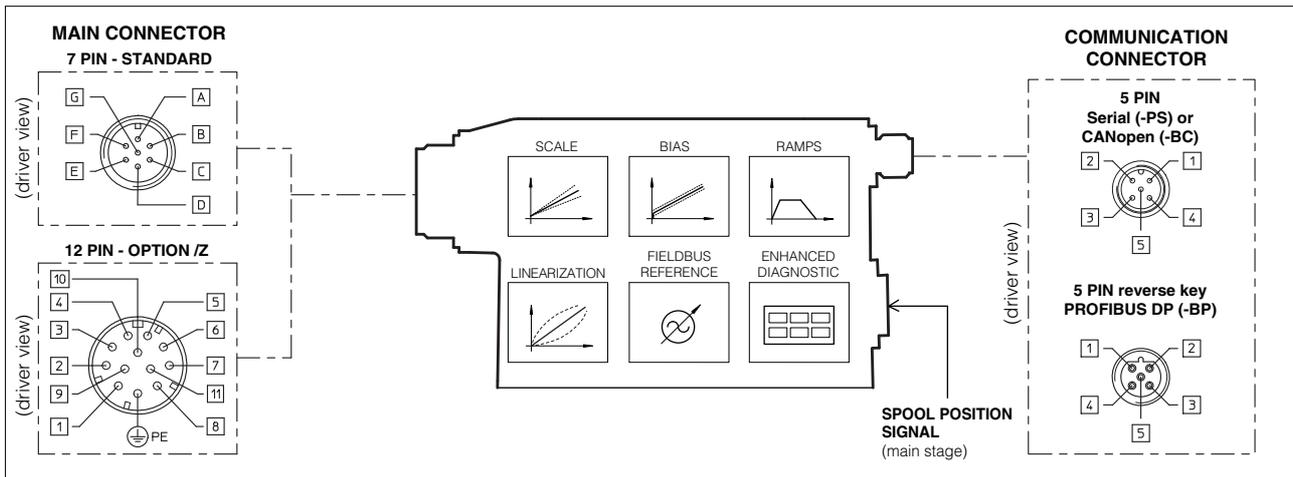
To enable the driver, supply a 24Vdc on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. This condition does not comply with European Norms EN954-1.

#### Fault Output Signal

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷20mA input, etc.). Fault presence corresponds to 0 Vdc, normal working corresponds to 24Vdc (pin 11 referred to pin 2): Fault status is not affected by the Enable input signal

### 8.3 Possible combined options: /IZ

## 9 DIGITAL INTEGRAL DRIVERS -TES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



### 9.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 Vdc for solenoid power stage (and for driver logic on 7 pin connection)	Input - power supply
B	2	V0	Power supply 0 Vdc for solenoid power stage (and for driver logic on 7 pin connection)	Gnd - power supply
-	3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver	Input - on/off signal
D	4	INPUT+	Reference analog input: 0 ÷ +10 Vdc maximum range (4 ÷ 20 mA for /I option) standard: differential input; /Z option: common mode INPUT+ referred to AGND	Input - analog signal
E	-	INPUT -		
C	5	AGND	Ground - signal zero for MONITOR signal signal zero for INPUT+ signal (only for /Z option)	Gnd - analog signal
F	6	MONITOR	Monitor analog output: ±10 Vdc maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 Vdc for driver logic	Input - power supply
-	10	VL0	Power supply 0 Vdc for driver logic	Gnd - power supply
-	11	FAULT	Fault (0V) or normal working (24V)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

**Note:** A minimum time of 300 to 500 ms have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

### 9.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

PIN	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
	SIGNAL	TECHNICAL SPECIFICATION	SIGNAL	TECHNICAL SPECIFICATION	SIGNAL	TECHNICAL SPECIFICATION
1	NC	do not connect	CAN_SHLD	Shield	+5V	for termination
2	NC	do not connect	NC	do not connect	LINE-A	Bus line (high)
3	RS_GND	Signal zero data line	CAN_GND	Signal zero data line	DGND	data line and termination Signal zero
4	RS_RX	Valves receiving data line	CAN_H	Bus line (high)	LINE-B	Bus line (low)
5	RS_TX	Valves transmitting data line	CAN_L	Bus line (low)	SHIELD	

## 10 SOFTWARE TOOLS

The functional parameters of the digital valves, as the bias, scale, ramp and linearization of the regulation characteristic, can be easily set and optimized with graphic interface by using the Atos E-SW software and the relevant USB adapters, cable and terminators, **see tab. G500**.

Valves with fieldbus communication interface (-BC and -BP) can be completely managed by the machine control unit; it is required to implement in the machine control the standard communication as described in the user manuals supplied with the relevant programming software.

For detailed description of available fieldbus features, **see tab. G510**

## 11 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES

Assembly position	Any position
Subplate surface finishing	Roughness index, $\sqrt{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -T execution; -20°C ÷ +60°C for -TE and TES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section <a href="#">11</a>
Recommended viscosity	15 ÷ 100 mm <sup>2</sup> /s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 18/15 achieved with in line filters of 10 µm and $\beta_{10} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	35 Watt
Insulation class	H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account
Protection degree (CEI EN-60529)	IP65 for -T execution; IP65÷67 for -TE and -TES executions, depending to the connector type (see sect. <a href="#">14</a> )
Duty factor	Continuous rating (ED=100%)

**12 DIAGRAMS** (based on mineral oil ISO VG 46 at 50 °C)

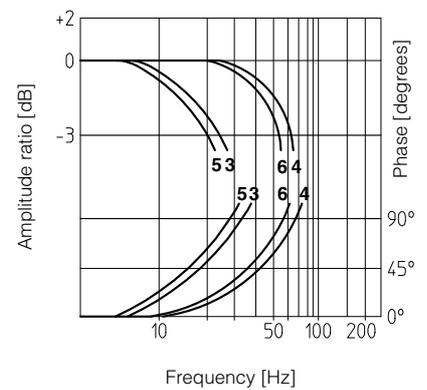
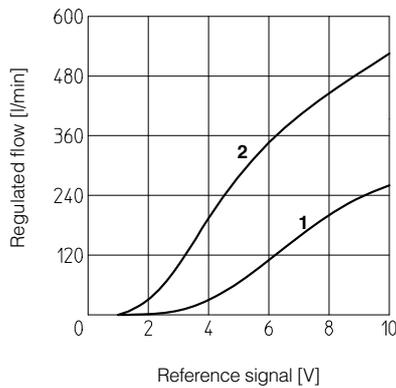
**12.1 Regulation diagrams, see note**

- 1 = LIQZO-T\*-162L4
- 2 = LIQZO-T\*-252L4

**12.2 Bode diagrams**

stated at nominal hydraulic conditions

- 3 = LIQZO-T\*-162L4: 10% ↔ 90%
- 4 = LIQZO-T\*-162L4: 50% ± 5%
- 5 = LIQZO-T\*-252L4: 10% ↔ 90%
- 6 = LIQZO-T\*-252L4: 50% ± 5%



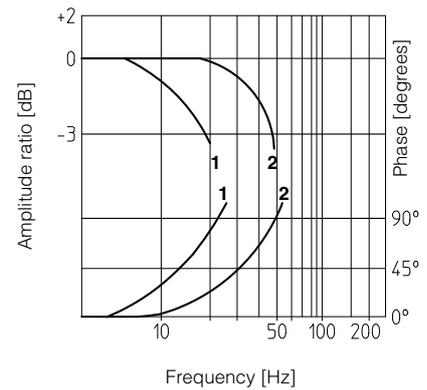
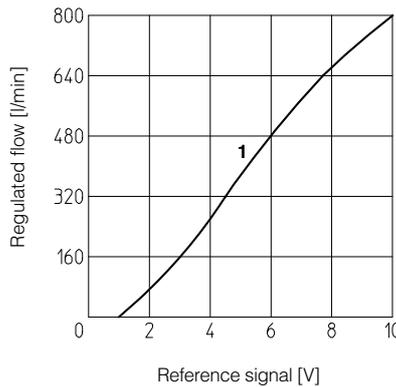
**12.3 Regulation diagrams, see note**

- 1 = LIQZO-T\*-322L4

**12.4 Bode diagrams**

stated at nominal hydraulic conditions

- 2 = LIQZO-T\*-322L4: 10% ↔ 90%
- 3 = LIQZO-T\*-322L4: 50% ± 5%



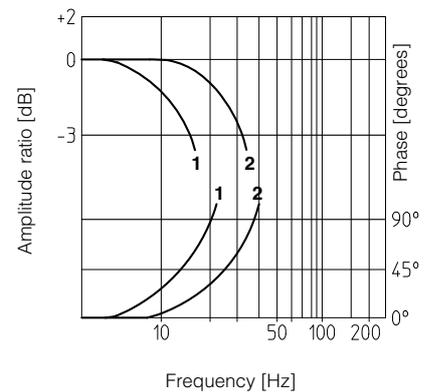
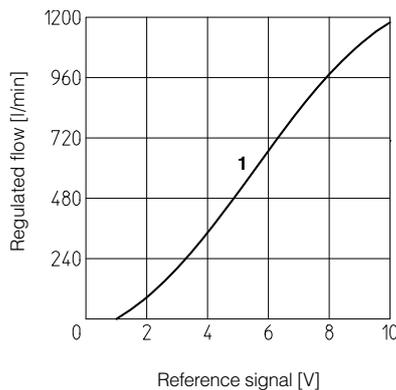
**12.5 Regulation diagrams, see note**

- 1 = LIQZO-T\*-402L4

**12.6 Bode diagrams**

stated at nominal hydraulic conditions

- 2 = LIQZO-T\*-402L4: 10% ↔ 90%
- 3 = LIQZO-T\*-402L4: 50% ± 5%



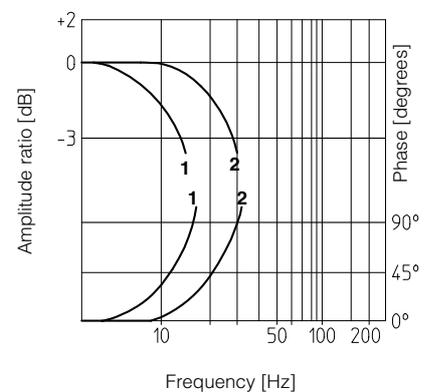
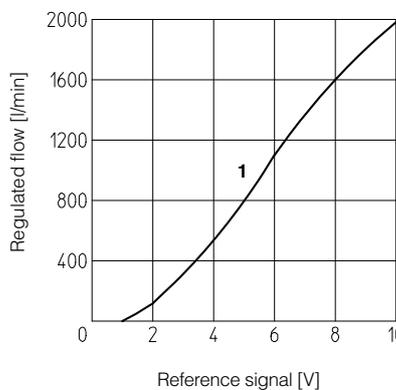
**12.7 Regulation diagrams, see note**

- 1 = LIQZO-T\*-502L4

**12.8 Bode diagrams**

stated at nominal hydraulic conditions

- 2 = LIQZO-T\*-502L4: 10% ↔ 90%
- 3 = LIQZO-T\*-502L4: 50% ± 5%



**Note:**

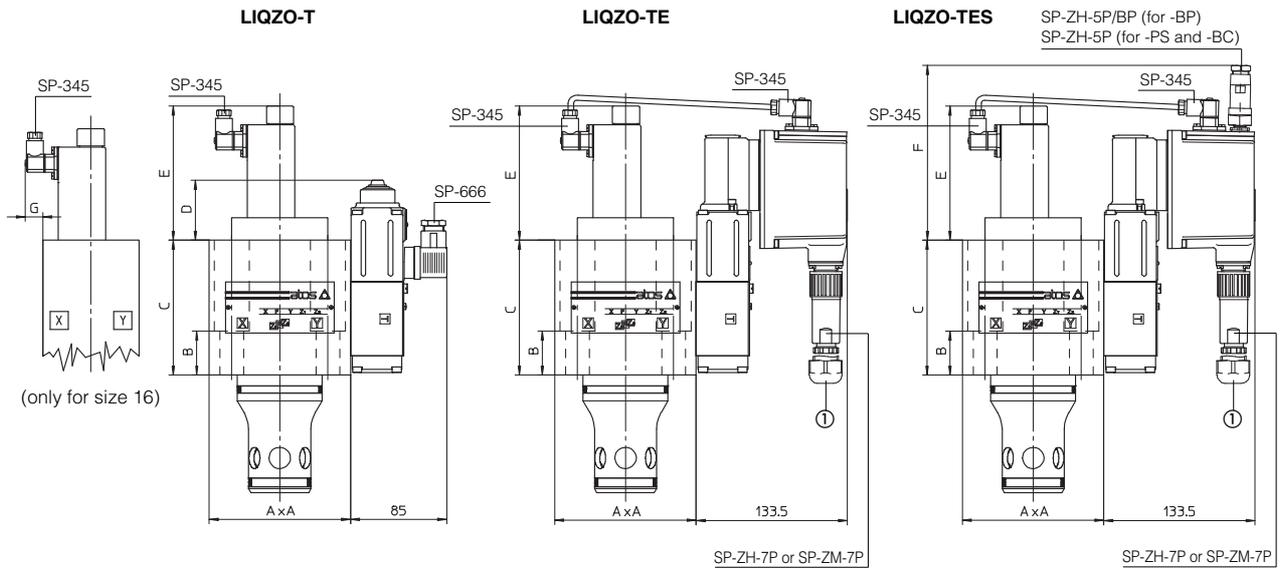
For the valves with digital electronics, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.

**12.9 Dynamic response**

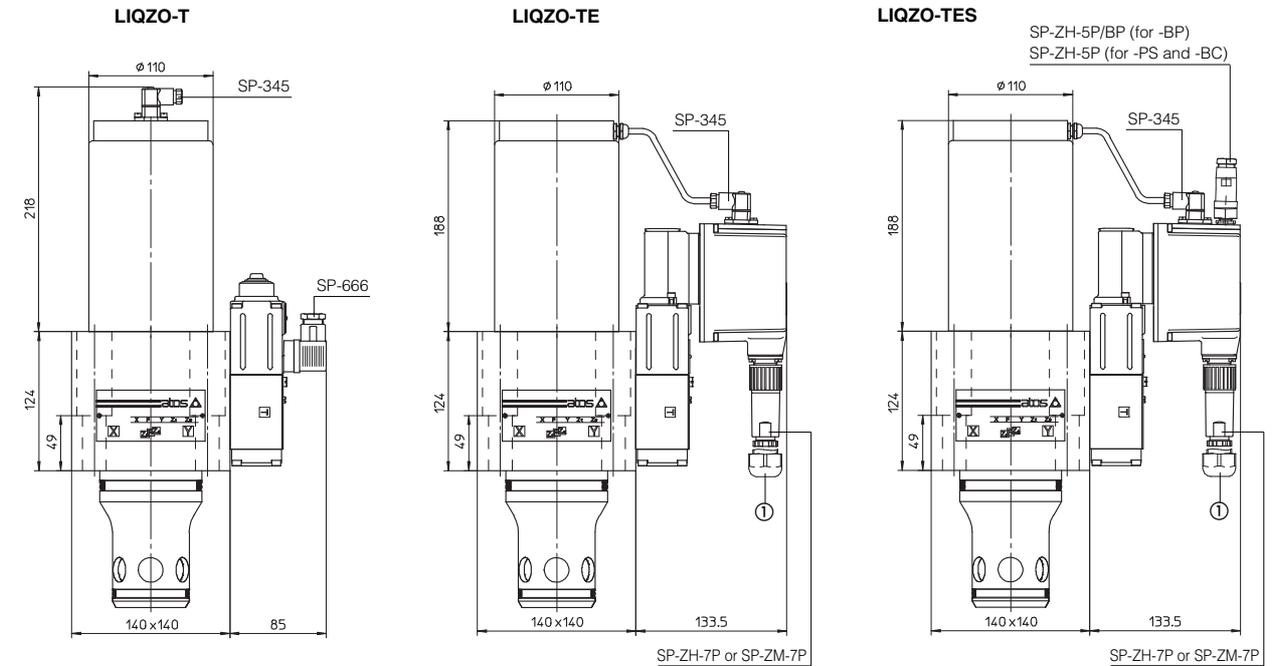
The response times in section 3 and the frequency responses of the bode diagrams in sections 12.2, 12.4, 12.6, 12.8, have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

13 INSTALLATION DIMENSIONS [mm]

Size 16, 25, 32, 40



Size 50



Size	A	B	C	D	E	F (TES)	G	Fastening bolts class 12.9	Tightening torque	Weight (Kg)	
										T	TE-TES
16	65	75	98	75	99,5	178	16	N°4 M8x90	35 Nm	5,2	5,8
25	85	80	95	78	114	182	-	N°4 M12x100	125 Nm	7,5	8,1
32	100	30	105	67	121	171	-	N°4 M16x60	300 Nm	10,2	10,8
40	125	39	120	53	119,5	157	-	N°4 M20x70	600 Nm	16	16,6
50	see drawing						-	N°4 M20x80	600 Nm	23,2	23,8

-TE\* EXECUTION

① Dotted line = 12 pin connector SP-ZH-12P for option /Z

Mounting surface and cavity: ISO 7368 (see table P006)

14 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-T Power supply Transducer		-TE, -TES		-TE/Z -TES /Z	TES -PS, -BC	TES -BP
CONNECTOR CODE	SP-666	SP-345	SP-ZH-7P	SP-ZM-7P	SP-ZH-12P	SP-ZH-5P	SP-ZH-5P/BP
PROTECTION DEGREE	IP65	IP65	IP67	IP67	IP65	IP67	IP67
DATA SHEET	K500		G200, G210, K500			G210, K500	

connectors supplied with the valve